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Cumulative effects of organizational stressors: Evidence for the buffering hypothesis

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ABSTRACT

Buffering effects of social support in organizational research are inconsistent. These inconsistencies may be partially explained by the under utilization of higher order interaction models. In this study, we conducted a higher order analysis assessing the cumulative effects of two work stressors (role overload and role clarity/ambiguity) in conditions where support from supervisors (vertical cohesion) and support from peers (horizontal cohesion) was either high or low. When social support from leaders was low, high levels of either role overload or high levels of role ambiguity were associated with high levels of distress. In contrast, when social support from leaders was high, high levels of distress did not occur unless both high workload and high role ambiguity were reported. Thus, high levels of social support buffered individuals from the adverse effects of a single stressors, but not form the adverse effects of multiple stressors. In the absence of a higher order analysis, these buffering effects would not have been detected.

Social support within an organization plays an important role in models of job stress. Social support from peers and leaders (i.e., supervisors) is believed to directly influence physical and mental well-being so that individuals with high social support exhibit high well-being. In addition, social support is believed to moderate or "buffer" the relationship between stressors and well-being such that individuals with high levels of social support exhibit some degree of protection from the negative effects of stressors (Cassel, 1976; Cobb, 1976; Cohen & Wills, 1985; George, Reed, Ballard, Colin & Feilding, 1993; LaRocco, House, & French, 1980). Often results from organizational studies examining the direct and buffering effects of social support have been contradictory. While several studies have clearly documented both the main effects and buffering effects of social support (see Abdel-Halim, 1982; George, et al., 1993; Gore, 1978; LaRocco, et al., 1980; Russell, Altmaier, & Van Velzen, 1987), others have failed to find evidence of either direct effects and/or buffering effects (see House & Wells, 1978; Blau, 1981; Turner, 1981; Kaufmann & Beehr, 1986). Indeed, some studies have found evidence of "anti-buffering" effects, with social support exacerbating or strengthening the negative effects of the stressors on psychological and physical health (Kaufmann & Beehr, 1986).

Ganster, Fusilier, and Mayes (1986) raised the possibility that the inconsistencies among these studies could be explained, in part, by the fact that most studies do not test for higher level (i.e., three-way) interactions. Ganster et al., (1986) contended that demographic variables such as education might impact the relationship between stressors and well-being since one of the effects of education is that it may help individuals appropriately adapt and respond to potentially distressful situations. Other important demographic variables that might also interact with stressors and well-being include gender, social class, and job level (e.g., Caplan, Cobb, French, Harrison & Pinneau, 1975; Etzion, 1984; Ganster et al., 1986; Leavy, 1983; Turner & Noh, 1983). While it seems reasonable to conclude that demographic variables are involved in moderating the relationship between stressors and physical and mental well-being, the evidence for such relationships is lacking. Ganster et al., (1986), for example, failed to demonstrate, using a higher-order analyses, that either gender, education, or blue- versus white-collar job status served as moderating variables. Nevertheless, given the intuitiveness of such relationships, further research should consider employing demographic variables in a higher order analysis when assessing the effects of social support on physical and mental well-being.

The use of higher order analysis, however, should not be limited only to the inclusion of demographic variables. Higher order analyses can also be used to examine the cumulative and interactive effects of more than one stressor in the relationship between social support and physical and mental health. It seems plausible that stressors, like demographics, may interact with each other in the stress-buffering relationship. For example, consider the case where an unmeasured stressor is present for a group of respondents. In this case, distress levels will already be elevated, and the ability to detect a stress-buffering relationship with a second stressor will be compromised by elevated distress levels due to the unmeasured stressor. Unmeasured and/or unmodeled variables in conjunction with an over reliance on two-way interaction models may, in part, contribute to inconsistent findings in stress-buffering research.

In the current study, we conducted a single higher order analysis to determine (a) whether demographic variables moderate the relationship between social support and psychological health and (b) whether the cumulative and interactive effects of two stressors produce evidence of buffering effects. The demographic variables included education and age; the two stressors were role overload and role clarity (i.e., ambiguity), and the two measures of social support were support from peers (horizontal cohesion) and support from supervisors (vertical cohesion). The outcome variable was mental health status as measured by the Global Severity Index (GSI) of the Brief Symptom Inventory (Derogatis & Melisaratos, 1983).

METHOD

Research Sample

The data for this study are drawn from a large study of US Army soldiers preparing for a training exercise. Questionnaire data assessing aspects of leadership climate, morale, and well-being were collected in the summer of 1996. The study sample consisted of 2,880 respondents from one infantry brigade. The majority of the respondents were male (97%), and 60% of the respondents were in the lower four enlisted ranks (E1-E4). Missing data on some of the variables of interest reduced the final study sample to 2,273.

Measures

Demographic Variables: Education and age were included as potential demographic moderators between the stressors and mental well-being (see Ganster et al., 1986). Education was measured with a single item asking the respondent to indicate the "Highest level of civilian education." The percent responding in each category in the total sample were as follows: (1) Some High School (<1%), (2) High School Diploma/GED (74%), (3) Vocational/Technical Diploma (6%), (4) Associates Degree (9%), (5) College Graduate (7%), and (6) Graduate Degree (<1%). Their was a 3% non-response rate to the item. Respondents with some high school and those with graduate degrees were omitted from the sample due to the low number of respondents per category. N-1 dummy codes were created yielding point-biserial and phi-coefficient values in the correlation matrix. Age was measured with a single item asking respondents to indicate their age on their last birthday. The average age was 25.09 years old. Rank and gender were not used in the final analyses. Rank was excluded because the high correlation between Rank and Education created singular matrices and prevented the identification of a model. Gender was excluded because of the low number of female respondents (3%).

Organizational Stressors. Role overload and role clarity were assessed using scales from the Michigan Organizational Assessment Questionnaire (Cammann, Fichman, Jenkins, & Klesh, 1983). The three item role overload scale has a reported reliability of .65 (Cammann, et al., 1983); however, in the current sample the scale had a reliability of .48. The three item role clarity scale had a reported reliability of .53 (Cammann, et al., 1983); on the current sample the reliability was .66.

Social/Organizational Support. Perceptions of support were assessed from both peers (horizontal cohesion) and leaders (vertical cohesion). The horizontal and vertical cohesion constructs are best conceptualized as measures of social support (Manning, 1991). Horizontal cohesion is a measure of the degree of fraternal bonding and kinship with a group (Bliese & Halverson, 1996). A five item scale was used to assess horizontal cohesion. Scale items assessed both the instrumental and emotional roles of social support. Typical items include "There are soldiers in my unit that I can go to for help when I have a personal problem", and "There are soldiers in my unit that I would consider my friends." The reliability of the horizontal cohesion scale was .83. Vertical cohesion is a 12-item scale assessing the degree of consideration and competence of leaders (Bliese & Halverson, 1996). Typical items are: "My officers are interested in my personal welfare" and "My NCOs delegate work effectively." The reliability of the scale was .90.

Psychological Well-Being: Psychological well-being was assessed using the 53-item General Severity Index (GSI) of the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983). The BSI has received considerable psychometric testing (see Boulet & Boss, 1991) . The cronbach's alpha reliability of the GSI was .97 in the study sample. In the analyses, a square-root transformation of the GSI was performed. This transformation on the GSI has been shown to substantially increase model fit, and help avoid spurious interactions (Bliese, Hoover, & Halverson, 1995).

RESULTS

Descriptive Statistics and Intercorrelations

Table 1 provides means, standard deviations, reliabilities, point-biserial, phi-coefficient and zero-order correlations for the data. The point-biserial correlations reveal that education level is negatively related to GSI levels in contrasts between respondents with Associate Degrees versus all others (r=-.06) and respondents who were college graduates versus all others (r=-.13). In general, higher education levels are related to lower GSI values, although the effect sizes associated with the relationships arguably lack practical significance. Table 1 also reveals that age is negatively related to distress levels. Role overload, role clarity, horizontal cohesion, and vertical cohesion were all related to distress levels in the anticipated directions. High levels of role overload were related to high levels of distress; high levels of role clarity were related to low levels of distress; and high levels of social support (horizontal and vertical cohesion) were related to low levels of distress.

To test for interactions, a hierarchical linear model was conducted in which main effects were entered first followed by two-way and then three-way interaction terms. QQPlots of the residuals (available from the authors) indicate that the final model had good fit. The results of the analysis are presented in Table 2. This table reveals that the main effects for all of the independent variables were significant. Only one of the two-way interactions was significant. This interaction was between age, vertical cohesion, and the GSI. Plots of this interaction (available from the authors) reveal that the relationship between vertical cohesion and distress is weaker for older respondents than for younger ones. In other words, poor leadership is more strongly related to distress for young respondents than for older respondents.

None of the three way interactions involving the demographic variables of age or education were significant. In contrast, the three-way interaction between role overload, role clarity, vertical cohesion, and the GSI was significant ($p < .001$). The plot of the three-way interaction involving vertical cohesion clearly supports the proposition that interactive and cumulative effects of stressors moderate the stress-buffering relationship. This plot is presented in Figure 1 and discussed in more detail in the discussion.

DISCUSSION

In this paper, we examined whether higher order analyses would be useful in detecting the buffering effects of social support. We too believed that demographic variables such as age and education might interact with the relationship between work stressors and psychological distress (see Ganster et al., 1986). However, no evidence of three-way interactions involving demographics were found despite the strong power associated with the large sample size used in the current study. In essence, these results mirror those reported by Ganster et al. (1986) in finding no evidence to suggest that demographic variables moderate the relationship between work stressors, social support and well-being.

In contrast to the effects of demographics, we did find evidence of higher order interactions when we examined the interactive and cumulative effects of the role overload and role clarity stressors. The form of this interaction is presented in Figure 1. It suggests that support from supervisors (leadership climate) buffers the relationship between either role clarity or role overload, and psychological well-being (distress). The top graph in Figure 1 (Figure a) shows the relationship between role clarity, role overload, and distress in the condition where social support from leaders is low. In this condition, high levels of either role overload or low role clarity (i.e., high ambiguity) are related to high levels of distress. In contrast, in cases where social support from leaders is high (Figure b) high levels of distress do not occur unless the respondent reports both high role overload and low role clarity. In other words, high levels of social support from supervisors buffers individuals from the negative effects of a single stressor, but not from the negative effects of dual stressors.

Figure 2 is a conceptual representation of the relationship between the strength of the stressor (low to high) and the absence or presence of the buffering effect. According to our model of stress-buffering, there exist two thresholds: a minimum and a maximum. The minimum threshold line indicates that the strength of the stressor must be of sufficient magnitude in order for buffering to occur. This aspect of the model is quite logical since buffering can not occur if there is "nothing" (i.e., the strength of stressor is low) to buffer. Conversely, the maximum threshold line indicates that buffering will not occur if the strength of the stressor (or multiple stressors) is extremely high. This is exactly the outcome we found in the present study. Buffering occurred in the presence of one stressor (either role overload or low role clarity), but not both.

From a practical perspective, the findings indicate that supportive leadership buffers individuals from the deleterious effects of stressors. Perhaps more importantly, though, the findings give a sense of the bounds within which this moderating relationship may be expected to be observed. The findings imply that supportive leadership ameliorates the negative effects of stressors as long as the stressors do not cross some "threshold." In the current study, the threshold was crossed when the respondent began to report experiencing two stressors. Once crossed, the buffering effects of a supportive leadership climate were no longer detectable. Thus, the findings provide evidence that supportive leadership ameliorates the negative effects of stressors while at the same time showing that supportive leadership is not a panacea that should be expected to reduce the negative effects of all stressors.

These findings clearly emphasize the importance of performing higher order analyses in studies of the stress-buffering hypothesis. We concur with Ganster et al. (1986) in their proposition that the inconsistent results reported in the organizational social support literature may be partially due to the fact that researchers seldom employ higher order models. We believe that future research examining the stress-buffering hypothesis needs to assess the cumulative and interactive effects of multiple stressors in the relationship between social support and well-being.

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Table 1:
Means, Standard Deviations, Point Biserial, Phi-Coefficient and Zero-order Correlations

			Correlation Matrix								
Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Vocational Deg. Vs. Others	0.06	0.23	-----								
2. Associate Deg. Vs. Others	0.09	0.30	-0.08	-----							
3. College Grad vs. Others	0.07	0.26	-0.07	-0.09	-----						
4. Age	25.09	5.74	0.06	0.24	0.14	-----					
5. Role Overload	3.03	0.77	0.03	0.01	0.03	0.04	(0.48)				
6. Role Clarity	3.57	0.79	0.00	0.01	0.05	0.12	-0.30	(0.66)			
7. Horizontal Cohesion	3.36	0.86	-0.04	-0.08	0.06	-0.13	-0.12	0.33	(0.83)		
8. Vertical Cohesion	3.14	0.84	-0.01	0.01	0.16	0.08	-0.27	0.36	0.30	(0.90)	
9. Square-root of the GSI	0.61	0.42	-0.02	-0.06	-0.13	-0.15	0.27	-0.26	-0.17	-0.34	(0.97)

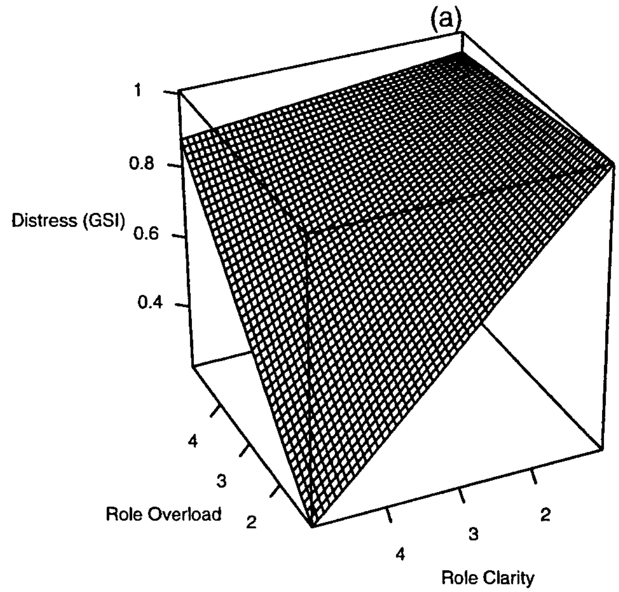
n = 2,273
All correlations greater than .06 are significant at $p < .01$, two-tailed. Reliabilities are provided in the diagonal in parentheses.

Table 2:
Hierarchical linear model predicting psychological distress (square-root GSI).

	Model Parameters			
Variable	DF	Sum of Squares	Mean Square	F Value
1. Education Level	3	9.40	3.13	21.41***
2. Age	1	5.68	5.68	38.82***
3. Role Overload	1	31.21	31.21	213.31***
4. Role Clarity	1	10.76	10.76	73.54***
5. Horizontal Cohesion	1	4.86	4.86	33.19***
6. Vertical Cohesion	1	14.25	14.25	97.41***
7. Educ. * Age	3	0.6	0.20	1.36
8. Educ. * Role Overld.	3	0.12	0.04	0.26
9. Educ. * Role Clar.	3	0.14	0.05	0.31
10. Educ. * Hor. Coh	3	0.23	0.08	0.52
11. Educ. * Ver. Coh	3	0.01	0.00	0.03
12. Age * Role Overld.	1	0.11	0.11	0.74
13. Age * Role Clar.	1	0.08	0.08	0.56
14. Age * Hor. Coh.	1	0.01	0.01	0.06
15. Age * Ver. Coh.	1	0.84	0.84	5.71**
16. Role Overld. * Role Clar.	1	0.00	0.00	0.02
17. Role Overld. * Hor. Coh.	1	0.13	0.13	0.91
18. Role Overld. * Ver. Coh.	1	0.01	0.01	0.08
19. Role Clar. * Hor. Coh.	1	0.15	0.15	1.05
20. Role Clar. * Ver. Coh.	1	0.03	0.03	0.21
21. Hor. Coh * Ver. Coh.	1	0.08	0.08	0.52
22. Educ. * Age * Wrk Overld.	3	0.70	0.23	1.59
23. Educ. * Age * Role Clar.	3	0.24	0.08	0.54
24. Educ. * Age * Hor. Coh.	3	0.18	0.06	0.41
25. Educ. * Age * Ver. Coh.	3	0.08	0.03	0.17
26. Educ. * Role Overld. * Role Clar.	3	0.81	0.27	1.84
27. Educ. * Role Overld. * Hor. Coh.	3	0.24	0.08	0.54
28. Educ. * Role Overld. * Ver. Coh.	3	0.38	0.13	0.87
29. Educ. * Role Clar. * Hor. Coh.	3	0.55	0.18	1.26
30. Educ. * Role Clar. * Ver. Coh.	3	0.51	0.17	1.17
31. Educ. * Hor. Coh. * Ver. Coh.	3	0.71	0.24	1.62
32. Age * Role Overld. * Role Clar.	1	0.35	0.35	2.38
33. Age * Role Overld. * Hor. Coh.	1	0.03	0.03	0.21
34. Age * Role Overld. * Ver. Coh.	1	0.00	0.00	0.03
35. Age * Role Clar. * Hor. Coh.	1	0.05	0.05	0.35
36. Age * Role Clar. * Ver. Coh.	1	0.02	0.02	0.13
37. Age * Hor. Coh. * Ver. Coh	1	0.15	0.15	1.02
36. Role Overld. * Role Clar. * Hor. Coh.	1	0.40	0.40	2.73*
37. Role Overld. * Role Clar. * Ver. Coh.	1	2.21	2.21	15.13***
38. Role Overld. * Hor. Coh. * Ver. Coh.	1	0.03	0.03	0.23
39. Role Clar. * Hor. Coh. * Ver. Coh.	1	0.04	0.04	0.29
Residual (Error)	2199	321.77	0.15	

$n = 2{,}273$

* $p < .10$, two-tailed; ** $p < .05$; *** $p < .001$, two-tailed



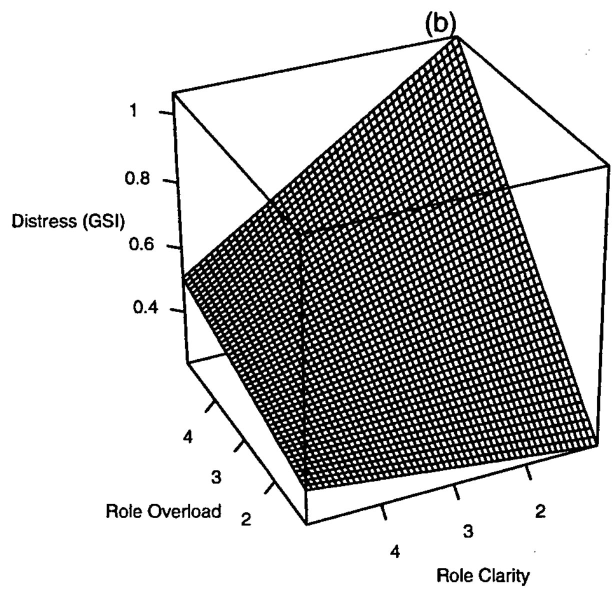


FIGURE 1. Relationship between Role Clarity, Role Overload and Distress when Vertical Cohesion is Low (a) and Vertical Cohesion is High (b)

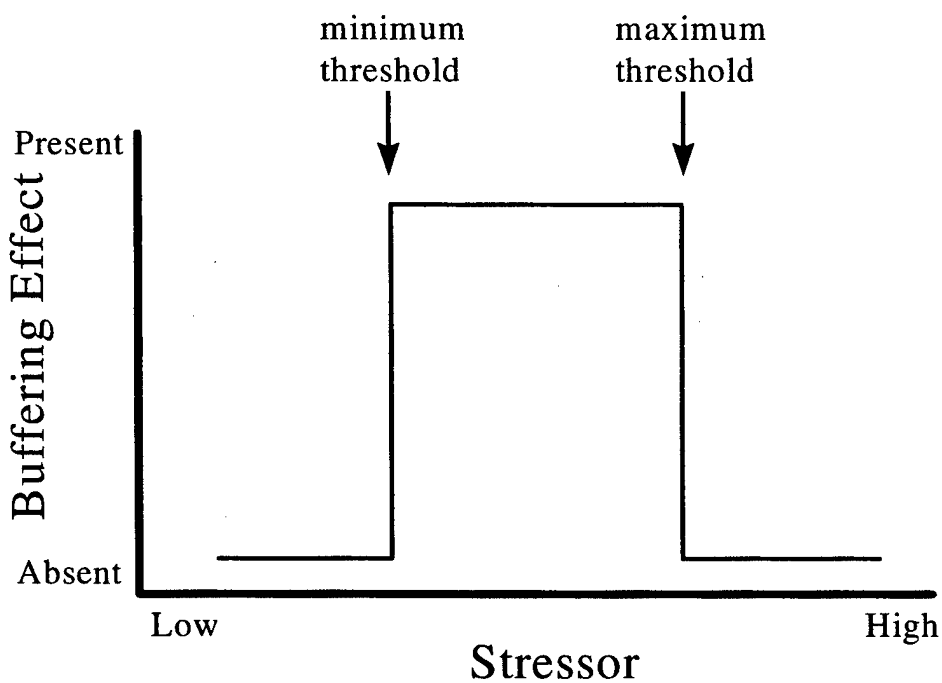


FIGURE 2. Dual Threshold Model of Stress-Buffering.

```
tmod<-lm(sqrt(NEWGSI)~(WLOAD+ROLE+HCOH+VCOH)^3,na.action=na.omit)
anova(tmod,test="F")

tmod<-lm(sqrt(NEWGSI)~WLOAD*ROLE,subset=VCOH<3.167,data=tdat2.3d)
TTM<-seq(min(tdat2.3d$WLOAD[tdat2.3d$VCOH<3.167]),max(tdat2.3d$WLOAD[tdat2.3d$VCOH<3.167]),length=50)
TTV<-seq(min(tdat2.3d$ROLE[tdat2.3d$VCOH<3.167]),max(tdat2.3d$ROLE[tdat2.3d$VCOH<3.167]),length=50)
TDAT<-list(WLOAD=TTM,ROLE=TTV)
grid<-expand.grid(TDAT)
fit<-predict(tmod,grid)
trellis.device(win.printer,height=4,width=5,file="clipboard",format="metafile")
wireframe(fit~WLOAD*ROLE, data=grid,scales=list(arrows=F),
screen=list(z=115,x=-60,y=0),xlab=list(cex=.5,"Role Overload            "),
ylab=list(cex=.5,"Role Clarity"),zlab=list(cex=.5, "  Distress (GSI)                 "))
title("(a)    \n",cex=.5)
dev.off()
title("Low Vertical Cohesion")

tmod<-lm(sqrt(NEWGSI)~WLOAD*ROLE,subset=VCOH>=3.167,data=tdat2.3d)
TTM<-seq(min(tdat2.3d$WLOAD[tdat2.3d$VCOH>=3.167]),max(tdat2.3d$WLOAD[tdat2.3d$VCOH>=3.167]),length=50)
TTV<-seq(min(tdat2.3d$ROLE[tdat2.3d$VCOH>=3.167]),max(tdat2.3d$ROLE[tdat2.3d$VCOH>=3.167]),length=50)
TDAT<-list(WLOAD=TTM,ROLE=TTV)
grid<-expand.grid(TDAT)
fit<-predict(tmod,grid)
trellis.device(win.printer,height=4,width=5,file="clipboard",format="metafile")
wireframe(fit~WLOAD*ROLE, data=grid,scales=list(arrows=F),
screen=list(z=115,x=-60,y=0),
xlab=list(cex=.5,"Role Overload          "),
ylab=list(cex=.5,"Role Clarity"),zlab=list(cex=.5, "  Distress (GSI)                 "))
title("(b)    \n",cex=.5)
dev.off()
title("High Vertical Cohesion")
```